

**LOS ANGELES COUNTY SHERIFF'S
DEPARTMENT**



**LAW ENFORCEMENT
MOTORCYCLE TEST
AND
EVALUATION PROGRAM**

NOVEMBER 2011

LEROY D. BACA, SHERIFF

INTRODUCTION

The Los Angeles County Sheriff's Department first implemented its police vehicle testing program in 1974, and motorcycle testing in 2008. Since that time, our Department has become nationally recognized as a major source of information relative to police vehicles and their use.

This year's motorcycle evaluation was conducted on November 10, 2011, by the Los Angeles County Sheriff's Department.

All major manufacturers of police motorcycles were invited to participate. BMW, Harley-Davidson, Honda, Kawasaki, and Victory each submitted motorcycles for evaluation. The motorcycles submitted were:

2011 BMW R 1200 RT-P

2011 Honda ST 1300-PA

2012 Harley-Davidson Electra Glide

2012 Harley-Davidson Road King

2012 Kawasaki Concours 14 ABS

2012 Victory Vision

2012 Victory Commander 1

All of the motorcycles submitted completed the test satisfactorily.

The testing process is designed to address the law enforcement officer's operational requirements in terms of motorcycle performance, safety, and comfort. The fleet maintenance interest is addressed by performing an extensive mechanical evaluation on each motorcycle submitted.

Each test is designed and executed to simulate actual field use conditions as closely as possible. Law enforcement motorcycle personnel conduct the evaluations on city streets, freeways, and the performance track.

This booklet is not intended as a recommendation for any specific motorcycle contained within, nor is it designed to rank the motorcycles in any order. Our motorcycle testing program is conducted in order to accomplish two primary goals. To provide law enforcement agencies with the data necessary to assist those in the motorcycle selection process, and to provide the various motorcycle manufacturers with the input necessary to better meet the needs of law enforcement.

We recognize the fact that individual agency needs can be influenced by cost, operational considerations and other factors. As such, interpretation of test results is the responsibility of each agency, and should be made based upon that agency's needs.

It is our goal to provide law enforcement agencies with the information they require to successfully evaluate and select the right motorcycle for their needs. We believe that we have accomplished that goal.

TABLE OF CONTENTS

Evaluation Protocol	4
Motorcycle Specifications	10
Basic Motorcycle Patterns	18
32 Lap High-Speed Course	21
Pursuit Course	29
Braking	37
Ergonomics	41
Acceleration and Fuel Efficiency	63
Heat Evaluation	65
Sound Level Evaluation	69
Mechanical Evaluation	72
Communication Noise Evaluation	87

MOTORCYCLE EVALUATION PROTOCOL

32 LAP HIGH-SPEED COURSE

TEST RIDER'S SUBJECTIVE EVALUATION

This evaluation is conducted on a high-speed riding course. It is designed to evaluate, identify and eliminate the obvious unacceptable motorcycles (i.e., those motorcycles that are demonstrably unstable or otherwise exhibit unsafe characteristics).

For this evaluation, four riders are utilized for each motorcycle. Each rider completes eight laps around our 1.46 mile test track at the Auto Club Speedway in Fontana, for a total of 32 timed laps. Lap timing is via a GPS based "VBOX Datalogger", mounted on the motorcycle. The fastest and the slowest lap times are eliminated, the remaining six lap times are averaged. The average time and speed are recorded next to the rider's name.

Four Emergency Vehicle Operations Center motorcycle training instructors, two each from the Los Angeles County Sheriff's Department and Los Angeles Police Department, share the riding and evaluation of these motorcycles.

At the conclusion of the preliminary handling portion of the evaluation, each rider completes a "Rider's Subjective Evaluation" form. If the motorcycle is judged unacceptable in this preliminary review, it is rejected and not subjected to further evaluation.

PURSUIT COURSE

This evaluation is for motorcycles identified by the manufacturer as intended for law enforcement use. This evaluation is conducted on a closed 2.45 mile city street course which closely represents the environment most urban law enforcement agencies must contend with. The course has virtually no straight-a-ways and consists of right and left turns and obstacles in the roadway.

This is the final track evaluation, and the manufacturers, if they so choose, are allowed to rebuild their motorcycle's brake system prior to this portion of the evaluation process.

For this evaluation, two riders are utilized for each motorcycle. Each rider completes two laps around the city or "pursuit" course. Lap timing is via a GPS based "VBOX Datalogger" timing device, mounted on the motorcycle. The combined times of the two laps are recorded next to the rider's name.

BASIC MOTORCYCLE PATTERNS

Five circle patterns will be used to determine each motorcycle's minimum turning radius. The diameters of the circles will be 20, 19, 18, 17 and 16 feet. The circle pattern will be entered at a speed of 2-3 mph. Once inside the circle, the rider will make three revolutions in one direction, exit the circle and make three more revolutions in the opposite direction. The circle pattern will be ridden in first gear.

Each motorcycle will be ridden in five different 180 degree U-Turn patterns. The diameters of the U-Turns will be 20, 19, 18, 17, and 16 feet. The U-Turn will be entered at a speed of 2-3 mph in first gear. The rider will fully turn the handlebars and lean the motorcycle as necessary to complete the turn. This is done in both directions.

The 30 mph cone weave consists of seven sets of three cones each, alternately offset from a center line at 36 foot intervals. The rider will approach the pattern from a sufficient distance to establish and maintain a speed of 30 mph. Using counter steering, the rider will weave the motorcycle around the seven sets of cones maintaining 30 mph, plus or minus 2 mph. The 30 mph cone weave represents steering or negotiating around debris or other hazards on the roadway.

The Short Cone Weave pattern utilizes eight single cones placed in a straight line at various distances. The cones will be placed at 11, 10 ½, 10 and 9 ½ foot intervals measured from cone center to cone center. The rider will negotiate the cone weave at about 1-2 mph in first gear, utilizing the rear brake as needed. Lock-to-lock turns will be used to successfully ride the course. This exercise represents typical motorcycle maneuverability used in slow-speed enforcement riding.

All of the Basic Motorcycle Pattern Evaluation protocols will be conducted by all four riders.

ACCELERATION PERFORMANCE EVALUATION

This evaluation is designed to measure motorcycle performance and control in terms of acceleration, including speed and time elapsed at the quarter mile. Although the top speed is not recorded, a minimum speed of 100 mph is generally obtained to satisfy the requirements for high-speed law enforcement patrol. Special attention will be paid to overall acceleration, stability, loss of rear wheel traction, and whether or not the front wheel lifts off the ground uncontrollably. Three runs will be made with each motorcycle. The results will be averaged.

All of the information gathered during the acceleration and subsequent brake evaluation is gathered using a "VBOX Datalogger". The "Datalogger" is a GPS based measuring device. This electronic device measures distance, time and speed.

BRAKE EVALUATION

This evaluation procedure measures the braking response and efficiency of the motorcycle. There are three different brake evaluations. A hard braking evaluation, a transitional braking evaluation from a dry to a wet surface, and a transitional braking evaluation from a smooth surface to a sandy surface.

The hard brake evaluation is conducted by first accelerating the motorcycle to 80 MPH, then decelerating to a stop, maintaining an average deceleration rate of 22 feet per second. This procedure is repeated three additional times. The motorcycle is then immediately accelerated to 60 mph and then stopped as quickly as possible, simulating a panic stop. That stopping distance is measured and recorded.

During the dry/wet braking evaluation, the motorcycle will be accelerated to 40 mph, and at a predetermined position, the brakes will be applied. The entire brake application will begin on a dry roadway surface, immediately transitioning onto a wet roadway surface while bringing the motorcycle to a full stop. Controllability of the motorcycle and its ABS operation will be evaluated.

During the debris field braking evaluation, the motorcycle will be accelerated to 40 mph, and at a predetermined position, the brakes will be applied. The entire brake application will take place on a smooth roadway surface, immediately transitioning to a roadway strewn with sand and gravel while bringing the motorcycle to a full stop. Controllability of the motorcycle and its ABS operation will be evaluated.

If a brake malfunction is experienced (i.e., severe brake fading), an effort is made to detect the cause of the brake failure. If it is decided that the failure is inherent in the engineering of the brake system of the motorcycle, the evaluation is discontinued and the motorcycle is disqualified from further evaluation. If the failure is associated with a correctable situation, it is corrected and the evaluation is run again. The defect and any remedial action taken are noted in the evaluation results.

ERGONOMICS & RIDEABILITY EVALUATION

157 MILE RIDE

This portion evaluates the fuel efficiency and ergonomics of the motorcycle during extended field operations. It is designed to simulate the types of situations that an officer may encounter during an eight hour shift. Each motorcycle is driven four times through a 157 mile loop, one loop completed by each of the four EVOC riders. The loop covers 33 miles of city streets, 75 miles of California freeways, 20 miles of coastal highway, and 29 miles of mountain canyons. No attempt is made to "baby" the motorcycle through the loop, and hard acceleration starts are avoided.

During the rideability evaluation, a minimum of ten simulated traffic stops will be performed while on city streets. The rider will be required to properly position the motorcycle in a safe traffic enforcement position, dismount the motorcycle, pause for a minimum of two minutes per stop, remount the motorcycle, and accelerate into traffic.

The numerical results of the evaluation are recorded and then averaged between the four riders. This average is then recorded as the final result of this portion of the evaluation. Each rider will also submit a subjective evaluation of each motorcycle at the end of the ride.

The fuel efficiency evaluation is an attempt to estimate MPG (miles per gallon) based on actual riding conditions. It is the average gas usage of all four riders, for all four loops.

This subjective evaluation is a rating of human factors done individually and independently by all four riders. The ratings are averaged to minimize personal prejudices that individuals may have for or against any given motorcycle. This evaluation rates each motorcycle comparatively for its general suitability and efficiency for patrol operations.

HEAT EVALUATION

The heat evaluation is a "PASS-FAIL" scenario and is based on manufacturer's allowable operating temperatures.

Heat from each engine component is measured by means of a digital thermometer with a bi-metallic probe and infrared heat gun at the conclusion of the 32 high-speed laps. This process is accomplished in the following manner:

1. Transmission Fluid The probe is inserted into the transmission via the oil fill hole.
2. Engine Oil The probe is inserted into the engine case via the oil fill hole, if accessible.
3. Radiator Coolant Temperature is measured via the infrared heat gun aimed below the top radiator tank.

MECHANICAL EVALUATION

The mechanical evaluation evaluates the day to day serviceability and maintenance of the motorcycle. It is performed by mechanics employed by Penske Truck Leasing, the maintenance contractor for the Los Angeles County Sheriff's Department.

Major consideration is given toward the accessibility and ease of repair of component parts for the purpose of obtaining a predictive evaluation of the time, and ease of major repairs. The specific factors considered in evaluating each component are enumerated on the Mechanical Evaluation form.

SOUND LEVEL EVALUATION

The sound level evaluation measures the sound levels of the motorcycle at different speeds. This evaluation is conducted at 40 mph, 60 mph, 80 mph, and while accelerating from 0 to 80 mph. The dB ratings are recorded with an EXTECH digital sound level meter. The sound level meter's microphone is mounted at the riders shoulder level, approximately 6 inches from his ear. During the fixed speed portion of the evaluation, the rider will accelerate to the identified speed, and after attaining that speed, will turn on the EXTECH meter and record the result. During the acceleration portion of the evaluation, the meter will be turned on, and the motorcycle will be accelerated to 80 mph. The meter will record the highest dB rating achieved during the entire acceleration of the motorcycle.

MOTORCYCLE SPECIFICATIONS

MOTORCYCLE SPECIFICATIONS

2011 BMW POLICE MOTORCYCLE R 1200 RT-P

Vehicle Description:	Full size, Sport Touring, Police Package motorcycle
Engine Type:	1170cc air/oil cooled, 2 cylinders
Bore and Stroke:	101mm x 73mm
Compression Ratio:	12.0:1
Valve Train:	4 valves per cylinder
Carburetor / Fuel Injection:	Electronic intake pipe injection
Ignition:	Digital engine management BMS-K with dual ignition and overrun fuel cut-off
Horsepower:	110 bhp @ 7,500 rpm
Torque:	88 Nm @ 6,000 rpm
Final Drive (shaft, chain, belt):	Shaft 1:1.882 ratio
Wet Weight:	Approximately 650 lbs
Alternator Output:	720 watt, 27 amps @ idle
Battery:	19 amp/hour linked gel (2)
Transmission:	Constant Mesh 6 speed
Clutch:	Self-adjusting hydraulic actuating single plate dry clutch
Suspension,	
Front:	Special front shock strut police application, 4.7 inches of travel
Rear:	Special travel-dependent damping system, 5.3 inches of travel
Brakes,	
Front:	Dual front disc ABS II partial integral system
Rear:	Single rear disc, independent rear brake control
Tires:	Fr - 120/70ZR-17 Rr - 180/55ZR-17
Wheels:	Die cast aluminum
Wheelbase:	58.4 inches Fork
Fork Angle:	63.4 degrees
Trail:	4.3 inches (castor in normal position)
Fuel Tank Capacity:	7.1 gallons with one gallon reserve
EPA Fuel Mileage:	65 hwy / 43 city
Seat Height:	32.2 inches, Solo Seat
Adjustments:	yes
Windscreen:	
Adjustable / Fixed	Adjustable, electric
Foot peg / Floorboard Position:	Foot Peg
Saddlebag Storage Capacity:	23 liters each, top opening

MOTORCYCLE SPECIFICATIONS

2012 HARLEY-DAVIDSON ELECTRA GLIDE

Vehicle Description:	Full size, Touring, Police Package motorcycle
Engine Type:	103 cu in, air/oil cooled, 2 cylinders Twin Cam
Bore and Stroke:	3.875 in x 4.375 in
Compression Ratio:	9.6: 1
Valve Train:	Pushrod operated, overhead hydraulic self-adjusting lifters; 2 valves per cylinder
Carburetor / Fuel Injection:	Electronic Sequential Port Fuel Injection (ESPFI)
Ignition:	Barrel key-Fairing
Horsepower:	N/A
Torque :	102 lb.ft @ 3500 rpm
Final Drive (shaft, chain, belt):	Drive belt, 32/68 ratio
Wet Weight:	831 lbs
Alternator Output:	Three-phase 50-Amp system, 585w @ 13V, 2000 rpm, 650 watt max @ 13V
Battery:	Sealed, maintenance-free; 12 volt, 28 amp/hour, 270 cca
Transmission:	6 speed Cruise Drive
Clutch:	multi-plate, wet
Suspension,	
Front:	41.3mm telescopic cartridge, 4.6 inches of travel
Rear:	Air adjustable shocks, 3.0 inches of travel
Brakes,	
Front:	Dual front disc w/ABS 11.81 in. x .28 in.
Rear:	Single disc w/ABS 11.81 in. x .28 in
Tires:	Dunlop® Harley-Davidson Series, bias blackwall Front – D408F 130/80B17 65H Rear – D407 180/65B16 81H
Wheels:	Black, Slotted disc cast aluminum
Wheelbase:	63.5 inches
Rake:	26 degrees
Fork Angle	29.25 degrees
Trail:	6.7 inches
Fuel Tank Capacity:	6.0 gallons with one gallon reserve
EPA Fuel Mileage:	Combined City/HWY 42mpg
Seat Height:	27.3 in. (laden) 30.7 in. (unladen)
Adjustments:	Air spring damping
Windscreen:	Fork-mounted fairing; clear, breakaway Lexan® windshield
Foot peg / Floorboard Position:	Floorboard
Saddlebag Storage Capacity:	Approx. 2000 cubic inches each, top opening

MOTORCYCLE SPECIFICATIONS

2012 HARLEY-DAVIDSON ROAD KING

Vehicle Description:	Full size, Touring, Police Package motorcycle
Engine Type:	103 cu in, air/oil cooled, 2 cylinders Twin Cam
Bore and Stroke:	3.875 in x 4.375 in
Compression Ratio:	9.6: 1
Valve Train:	Pushrod operated, overhead hydraulic self-adjusting lifters; 2 valves per cylinder
Carburetor / Fuel Injection:	Electronic Sequential Port Fuel Injection (ESPFI)
Ignition:	Electronic
Horsepower:	N/A
Torque :	102 lb.ft @ 3500 rpm
Final Drive (shaft, chain, belt):	Drive belt, 32/68 ratio
Wet Weight:	828 lbs
Alternator Output:	Three-phase 50-Amp system, 585w @ 13V, 2000 rpm, 650 watt max @ 13V
Battery:	Sealed, maintenance-free; 12 volt, 28 amp/hour, 270 cca
Transmission:	6 speed Cruise Drive
Clutch:	multi-plate, wet
Suspension,	
Front:	41.3mm telescopic cartridge, 4.6 inches of travel
Rear:	Air adjustable shocks, 3.0 inches of travel
Brakes,	
Front:	Dual front disc w/ABS 11.81 in. x .28 in.
Rear:	Single disc w/ABS 11.81 in. x .28 in
Tires:	Dunlop® Harley-Davidson Series, bias blackwall Front – D408F 130/80B17 65H Rear – D407 180/65B16 81H
Wheels:	Black, Slotted disc cast aluminum
Wheelbase:	63.5 inches
Rake:	26 degrees
Fork Angle	29.25 degrees
Trail:	6.69 inches
Fuel Tank Capacity:	6.0 gallons with one gallon reserve
EPA Fuel Mileage:	Combined City/HWY 42mpg
Seat Height:	27.3 in. (laden) 30.7 in. (unladen)
Adjustments:	Air spring damping
Windscreen:	Fork-mounted clear, breakaway Lexan® windshield
Foot peg / Floorboard Position:	Floorboard
Saddlebag Storage Capacity:	Approx 2000 cubic inches each, top opening

MOTORCYCLE SPECIFICATIONS

2011 HONDA POLICE MOTORCYCLE ST 1300-PA

Vehicle Description:	Full size, Sport Touring, Police Package motorcycle
Engine Type:	1261cc liquid cooled 90 degree V-4
Bore and Stroke:	78mm x 66mm
Compression Ratio:	10.8:1
Valve Train:	DOHC, 4 valves per cylinder
Carburetor / Fuel Injection:	PGM-FI with automatic enricher circuit
Ignition:	Computer Controlled digital with three dimensional mapping and electronic advance
Horsepower:	125 bhp @ 8000 rpm
Torque:	85 lb.ft. @ 6000 rpm
Final Drive (shaft, chain, belt):	Shaft
Dry Weight:	679 lbs
Alternator Output:	660 watt, high output
Battery:	Odyssey P.C. 545 Gel Battery with 6 Amp Battery Charger
Transmission:	Five speed
Clutch:	8 plate wet, hydraulic
Suspension,	
Front:	45mm HMAS cartridge fork, 4.6 inches of travel
Rear:	HMAS gas-charged single shock, 4.8 inches of travel
Brakes,	
Front:	Dual full floating 310mm floating front discs w/ABS
Rear:	Single 316mm rear disc w/ABS
Tires:	Fr - 120/70ZR-18 Rr - 170/60ZR-17
Wheels:	3 spoke U-section cast aluminum
Wheelbase:	58.7 inches
Rake:	26.0 degree
Trail:	98mm / 3.9 inches
Fuel Tank Capacity:	7.7 gallons
EPA Fuel Mileage:	
Seat Height:	31.1 inches (+/- 0.6 inches)
Adjustments:	3 positions
Windscreen:	
Adjustable / Fixed	Adjustable, electric, 7.4 inches & 13 degrees adjustability
Foot peg / Floorboard Position:	Foot Peg
Saddlebag Storage Capacity:	35 liters each, side opening, detachable

MOTORCYCLE SPECIFICATIONS

2012 KAWASAKI CONCOURS 14 ABS

Vehicle Description:	Full size, Sport Touring, Police Package motorcycle
Engine Type:	1352cc liquid cooled inline 4 cylinder
Bore and Stroke:	84mm x 61mm
Compression Ratio:	10.7:1
Valve Train:	DOHC, 4 valves per cylinder, shim under bucket valve adjustment
Carburetor / Fuel Injection:	Electronic fuel injection
Ignition:	Transistorized
Horsepower:	155 bhp @ 88000 rpm
Torque:	102 lb.ft. @ 66000 rpm
Final Drive (shaft, chain, belt):	Shaft
Wet Weight:	749 lbs
Alternator Output:	581 watts @ 5,000 rpm
Battery:	14 amp/hour, 12 volt
Transmission:	6 speed
Clutch:	Multi-plate in oil bath
Suspension,	
Front:	43mm male-slider fork, adjustable preload and rebound damping, 4.4 inches travel
Rear:	Monoshock, adjustable preload and rebound damping, 5.4 inches travel
Brakes,	
Front:	Dual 310 mm petal discs with four piston radial mount calipers - ABS
Rear:	Single 240 mm petal disc, two piston, double action caliper
Tires:	Fr – 120/70ZR17 Rr – 190/50ZR17
Wheels:	Cast aluminum rims
Wheelbase:	59.8 inches
Rake:	26.1 degrees
Trail:	4.4 inches
Fuel Tank Capacity:	5.8 gallons
EPA Fuel Mileage:	Combined 36 mpg
Seat Height:	32 inches
Adjustments:	no
Windscreen:	
Adjustable / Fixed	Fixed
Foot Peg / Floorboard Position:	Foot peg
Saddlebag Storage Capacity:	35 liters (does not include radio box volume)

MOTORCYCLE SPECIFICATIONS

2012 VICTORY VISION

Vehicle Description:	Full size, Touring, Police Package motorcycle
Engine Type:	1731cc air/oil cooled, 2 cylinders V-Twin Overhead Cam
Bore and Stroke:	101mm x 108mm
Compression Ratio:	9.4:1
Valve Train:	Overhead Cams
Carburetor / Fuel Injection:	Electronic fuel injection /dual 45mm throttle body
Ignition:	Electronic
Horsepower:	97
Torque:	113 lb.ft. @ 2,700 rpm
Final Drive (shaft, chain, belt):	Carbon fiber reinforced belt
Wet Weight:	798 lbs
Alternator Output:	50 amp
Battery:	18 amp/hour, 12 volt, 240 CCA
Transmission:	6 speed
Clutch:	Multi-plate
Suspension,	
Front:	46mm male-slider fork, adjustable preload and rebound damping, 5.1 inches travel
Rear:	Link mono air adjustable shock. Travel-4.7 inch
Brakes,	
Front:	Dual 300 x 5 mm floating rotors w/4-piston calipers ABS
Rear:	Single 300 x 7 mm floating rotor w/2-piston calipers ABS Independent ABS
Tires:	Fr – Dunlop Elite 3 130/70R18 Rr – Dunlop Elite 3 180/60R16
Wheels:	Cast aluminum rims
Wheelbase:	65.7 inches
Rake:	29.0 degrees
Trail:	5.6 inches
Fuel Tank Capacity:	5.8 gallons
EPA Fuel Mileage:	Combined 44.5 mpg
Seat Height:	26.25 inches
Adjustments:	no
Windscreen:	
Adjustable / Fixed	Electric Adjustable
Foot Peg / Floorboard Position:	Foot peg
Saddlebag Storage Capacity:	35 liters (does not include radio box volume)

MOTORCYCLE SPECIFICATIONS

2012 VICTORY COMMANDER 1

Vehicle Description:	Full size, Touring, Police Package motorcycle
Engine Type:	1731cc air/oil cooled, 2 cylinders V-Twin Overhead Cam
Bore and Stroke:	101mm x 108mm
Compression Ratio:	9.4:1
Valve Train:	Overhead Cams
Carburetor / Fuel Injection:	Electronic fuel injection /dual 45mm throttle body
Ignition:	Electronic
Horsepower:	97
Torque:	113 lb.ft. @ 2,700 rpm
Final Drive (shaft, chain, belt):	Carbon fiber reinforced belt
Wet Weight:	798 lbs
Alternator Output:	50 amp
Battery:	18 amp/hour, 12 volt, 240 CCA
Transmission:	6 speed
Clutch:	Multi-plate
Suspension,	
Front:	46mm male-slider fork, adjustable preload and rebound damping, 5.1 inches travel
Rear:	Link mono air adjustable shock. Travel-4.7 inch
Brakes,	
Front:	Dual 300 x 5 mm floating rotors w/4-piston calipers
Rear:	Single 300 x 7 mm floating rotor w/2-piston calipers
	Hydraulic linked ABS
Tires:	Fr – Dunlop Elite 3 130/70R18 Rr – Dunlop Elite 3 180/60R16
Wheels:	Cast aluminum rims
Wheelbase:	65.7 inches
Rake:	29.0 degrees
Trail:	5.4 inches
Fuel Tank Capacity:	5.8 gallons
EPA Fuel Mileage:	Combined 44.5 mpg
Seat Height:	26.25 inches
Adjustments:	no
Windscreen:	
Adjustable / Fixed	Electric Adjustable
Foot Peg / Floorboard Position:	Foot peg
Saddlebag Storage Capacity:	35 liters (does not include radio box volume)

BASIC MOTORCYCLE PATTERNS

BASIC MOTORCYCLE PATTERNS

2011 BMW R 1200 RT-P					
PATTERN	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	YES	N
U-Turn	YES	YES	YES	YES	Y
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	YES	Y	
PATTERN		CONSIDERATION			RATING**
30 MPH Cone Weave		Counter steering effort / Bike Drag			4

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2012 KAWASAKI CONCOURS 14 ABS					
PATTERN	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	YES	N
U-Turn	YES	YES	YES	YES	Y
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	YES	N	
PATTERN		CONSIDERATION			RATING**
30 MPH Cone Weave		Counter steering effort / Bike Drag			3

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2012 HARLEY-DAVIDSON ELECTRA GLIDE					
PATTER	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	YES	NO
U-Turn	YES	YES	YES	YES	YES
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	YES	YES	
PATTERN		CONSIDERATION			RATING**
30 MPH Cone Weave		Counter steering effort / Bike Drag			4

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2012 HARLEY-DAVIDSON ROAD KING					
PATTER	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	NO	NO
U-Turn	YES	YES	YES	YES	YES
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	YES	YES	YES
PATTERN	CONSIDERATION			RATING**	
30 MPH Cone Weave	Counter steering effort / Bike Drag			4	

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2011 HONDA ST 1300- PA					
PATTER	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	YES	NO
U-Turn	YES	YES	YES	YES	YES
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	YES	YES	NO
PATTERN	CONSIDERATION			RATING**	
30 MPH Cone Weave	Counter steering effort / Bike Drag			5	

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2012 VICTORY VISION					
PATTER	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	YES	YES	NO	NO
U-Turn	YES	YES	YES	NO	NO
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	NO	NO	NO
PATTERN	CONSIDERATION			RATING**	
30 MPH Cone Weave	Counter steering effort / Bike Drag			4	

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

2012 VICTORY COMMANDER 1					
PATTER	20 FT.	19 FT.	18 FT.	17 FT.	16 FT.
Circle	YES	NO	NO	NO	NO
U-Turn	YES	YES	YES	NO	NO
PATTERN	11 FT.	10 ½ FT.	10 FT.	9 ½ FT.	
Short Cone Weave	YES	YES	NO	NO	NO
PATTERN	CONSIDERATION			RATING**	
30 MPH Cone Weave	Counter steering effort / Bike Drag			5	

** Rating Scale – 1 – Poor 3 – Average 5 – Outstanding

32 LAP HIGH-SPEED COURSE

MOTORCYCLE DYNAMICS

EVALUATION

32 LAP HIGH-SPEED COURSE **MOTORCYCLE DYNAMICS EVALUATION**

2011 BMW R 1200 RT-P

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:26.06	60.9
Deputy S. Bryant, LASD	9 thru 16	1:26.26	61.0
Officer B. Wilson, LAPD	17 thru 23	1:29.98	58.3
Deputy M. Brown, LASD	24 thru 32	1:29.15	58.8

ITEM	RATING**
STEERING	9.5
LEAN ANGLE	9.5
SUSPENSION	9
BRAKE FADE	9
BRAKE PULL	9
ABS OPERATION	9

****Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding**

RIDER COMMENTS

Brakes – Smooth and controlled, easy to modulate. ABS operation was transparent.

Cornering/Handling – Good lean angle. Side to side transition very good. Handling is very forgiving for the rider.

Transmission (Shift Points) – Transmission shifts consistent and firm, slides into gear with very little effort. Smooth clutch lever operation and engagement. Gear ratios evenly spaced.

Engine – Builds power hard above 2500 rpm. Broad powerband made acceleration predictable throughout the rpm range.

32 LAP HIGH-SPEED COURSE
MOTORCYCLE DYNAMICS EVALUATION

2012 KAWASAKI CONCOURS 14 ABS

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:26.85	60.3
Deputy S. Bryant, LASD	9 thru 16	1:27.24	60.3
Officer B. Wilson, LAPD	17 thru 23	1:33.83	56.1
Deputy M. Brown, LASD	24 thru 32	1:29.59	58.6

ITEM	RATING**
STEERING	8.2
LEAN ANGLE	8.7
SUSPENSION	8
BRAKE FADE	8.5
BRAKE PULL	8
ABS OPERATION	8.2

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDER COMMENTS
<p>Brakes – Hard, consistent brake pull with every application. Some brake fade noticed at lap 7&8 in all four sessions but did not deter confidence in the brakes.</p> <p>Cornering/Handling – Cornering very good with good lean angle. Bike counter steered easily and handling was good in all corners.</p> <p>Transmission (Shift Points) – Transmission evenly matched with engine. Easy engagement throughout the rpm range.</p> <p>Engine – Engine creates lots of power. High revs allow range of use in all gears. Smooth and quick power delivery.</p> <p>Other – Traction control helps maintain control when exiting corners. Excellent feedback to the rider. Bike is extremely fast and quick.</p>

32 LAP HIGH-SPEED COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 HARLEY-DAVIDSON ELECTRA GLIDE

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:33.49	56.0
Deputy S. Bryant, LASD	9 thru 16	1:37.17	54.3
Officer B. Wilson, LAPD	17 thru 23	1:39.23	53.3
Deputy M. Brown, LASD	24 thru 32	1:36.56	54.3

ITEM	RATING**
STEERING	7.7
LEAN ANGLE	6
SUSPENSION	8
BRAKE FADE	8
BRAKE PULL	8
ABS OPERATION	8

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDER COMMENTS
<p>Brakes – Brakes had a firm and progressive feel. Smooth application. No fade.</p> <p>Cornering/Handling – Cornering hindered by poor lean angle and floorboard contact. Holds corner line well with good turn in and exit.</p> <p>Transmission (Shift Points) – Gear ratio well-spaced which kept engine in its power band. Solid gear changes. Shift lever easy to operate.</p> <p>Engine – Power is constant and predictable. Pulled well through the gears. Good low end power.</p>

32 LAP HIGH-SPEED COURSE **MOTORCYCLE DYNAMICS EVALUATION**

2012 HARLEY-DAVIDSON ROAD KING

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:35.11	55.2
Deputy S. Bryant, LASD	9 thru 16	1:36.66	54.8
Officer B. Wilson, LAPD	17 thru 23	1:39.97	52.8
Deputy M. Brown, LASD	24 thru 32	1:36.90	54.1

ITEM	RATING**
STEERING	7.5
LEAN ANGLE	6
SUSPENSION	7
BRAKE FADE	7
BRAKE PULL	7
ABS OPERATION	6

****Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding**

RIDER COMMENTS
<p>Brakes – Brakes worked well with no fade. Brakes easy to modulate with quick stopping ability. ABS worked well during heavy braking.</p> <p>Cornering/Handling – Steering input light and predictable. Lean angle is adequate but frame and floorboard contact happens quickly. Overall handling and cornering is smooth.</p> <p>Transmission (Shift Points) – Heel-toe shifter has a positive feel and operated smoothly. Gear ratios evenly spaced.</p> <p>Engine – Good low end torque. Engine pulled hard to 5000 rpm. Acceleration was smooth and constant throughout the gears.</p>

32 LAP HIGH-SPEED COURSE **MOTORCYCLE DYNAMICS EVALUATION**

2011 HONDA ST 1300-PA

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:27.03	60.0
Deputy S. Bryant, LASD	9 thru 16	1:29.05	59.0
Officer B. Wilson, LAPD	17 thru 23	1:32.47	57.0
Deputy M. Brown, LASD	24 thru 32	1:29.36	58.6

ITEM	RATING**
STEERING	8
LEAN ANGLE	7
SUSPENSION	8
BRAKE FADE	9
BRAKE PULL	9
ABS OPERATION	9

****Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding**

RIDER COMMENTS

Brakes – Great stopping ability at all speeds. Brakes felt solid with no fade. Difficult to apply rear brakes with foot control in low right corners due to low position of the brake control. ABS engaged and worked smoothly.

Cornering/Handling – Rolls quick and consistent into corners. Holds line firmly with slight rear tire slip on exits. Lean angle ok due to rider's foot placement on pegs. Foot pegs are low and allow riders boots to drag.

Transmission (Shift Points) – Shifts firm with little effort. Gear ratios well matched to powerband.

Engine – Consistent acceleration throughout the rpm range. Good torque, quick response to throttle input. Solid useable power.

32 LAP HIGH-SPEED COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 VICTORY VISION

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:38.19	53.4
Deputy S. Bryant, LASD	9 thru 16	1:38.64	53.3
Officer B. Wilson, LAPD	17 thru 23	1:43.28	51.0
Deputy M. Brown, LASD	24 thru 32	1:40.06	52.3

ITEM	RATING**
STEERING	7.7
LEAN ANGLE	5
SUSPENSION	7.7
BRAKE FADE	7.2
BRAKE PULL	7
ABS OPERATION	8.5

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDER COMMENTS
<p>Brakes – Brakes activation smooth with good feedback through the front brake lever. Slight brake fade felt on laps 3&4 during first session and laps 5&6 during third session. Rear brake pedal in good location, easy to activate.</p> <p>Cornering/Handling – Steering input easy and responsive. Lean angle average due to floorboard and crash bar contact in corners.</p> <p>Transmission (Shift Points) – Smooth shifts throughout. Shift lever feels tight against the engine, awkward to find at times.</p> <p>Engine – Strong engine with good low end torque. Consistent power throughout the gear range.</p>

32 LAP HIGH-SPEED COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 VICTORY COMMANDER 1

RIDER	LAPS	AVG. TIME	AVG. SPEED
Officer M. Nowlen, LAPD	1 thru 8	1:36.00	54.6
Deputy S. Bryant, LASD	9 thru 16	1:37.61	53.8
Officer B. Wilson, LAPD	17 thru 23	1:42.99	51.4
Deputy M. Brown, LASD	24 thru 32	1:39.88	52.5

ITEM	RATING**
STEERING	7.5
LEAN ANGLE	6.5
SUSPENSION	7.7
BRAKE FADE	7
BRAKE PULL	6.7
ABS OPERATION	8

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDER COMMENTS
<p>Brakes – Brakes came on slow. Felt spongy on application. ABS is seamless with constant activations. Some brake fade felt.</p> <p>Cornering/Handling – Shallow lean angle, handling through the corners was predictable. Bike dragged fairly easy through corners.</p> <p>Transmission (Shift Points) – Shifts smoothly, no missed shifts. Rear shift pedal tucked in close to the engine. Gear ratios well-spaced.</p> <p>Engine – Builds power smooth and consistent. Plenty of low and mid-range torque.</p>

PURSUIT COURSE
MOTORCYCLE DYNAMICS
EVALUATION

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2011 BMW R 1200 RT- P

RIDER	TOTAL TIME	AVG. SPEED
Officer M. Nowlen, LAPD	4:06.05	35.9
Deputy M. Brown, LASD	4:15.84	34.6

ITEM	RATING**
STEERING	9
LEAN ANGLE	9.5
SUSPENSION	8.5
BRAKE FADE	9
BRAKE PULL	9
ABS OPERATION	9

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS
<p>Brakes – Brake activation quick and consistent. Excellent feedback through the controls. ABS operation appropriate and predictable.</p> <p>Cornering/Handling – Lean angle through corners was excellent. Great ground clearance, stable through all the corners. Minimal wheel slippage through the corners.</p> <p>Transmission (Shift Points) – Smooth shifts with no missed gears. Well matched to the engine.</p> <p>Engine – Strong and pulled very well throughout the rpm range.</p>

PURSUIT COURSE MOTORCYCLE
DYNAMICS EVALUATION

2012 HARLEY-DAVIDSON ELECTRA GLIDE

RIDER	TOTAL TIME	AVG. SPEED
Officer M. Nowlen, LAPD	4:31.27	32.6
Deputy M. Brown, LASD	4:34.06	32.3

ITEM	RATING**
STEERING	7.5
LEAN ANGLE	6
SUSPENSION	6.5
BRAKE FADE	8
BRAKE PULL	8.5
ABS OPERATION	8

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS
<p>Brakes – Brakes worked very well, good feedback.</p> <p>Cornering/Handling – Smooth lean but runs out of lean angle quick. Floorboards and frame drag through corners.</p> <p>Transmission (Shift Points) – Gearing is evenly matched for acceleration and rider use. No missed shifts</p> <p>Engine – Strong engine with broad powerband.</p>

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 HARLEY-DAVIDSON ROAD KING

RIDER	TOTAL TIME	AVG. SPEED
Deputy M. Nowlen, LAPD	4:31.68	32.6
Officer B. Wilson, LAPD	4:46.52	30.9

ITEM	RATING**
STEERING	7
LEAN ANGLE	5.5
SUSPENSION	7.5
BRAKE FADE	10
BRAKE PULL	9
ABS OPERATION	9

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS

Brakes – Positive feel to the brakes. Smooth application with no fade.

Cornering/Handling – Leans into turns smoothly but slightly unstable at the handlebars when under heavy braking in the turns. Lean angle adequate with noticeable drag at the floorboards and frame.

Transmission (Shift Points) – Smooth shifts with no missed gears. Well matched to the engine.

Engine – Strong and pulled very well throughout the rpm range.

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2011 HONDA ST 1300-PA

RIDER	TOTAL TIME	AVG. SPEED
Officer M. Nowlen LAPD	4:12.32	35.1
Deputy M. Brown, LASD	4:10.67	35.3

ITEM	RATING**
STEERING	8.5
LEAN ANGLE	8.5
SUSPENSION	8
BRAKE FADE	9
BRAKE PULL	9
ABS OPERATION	8

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS

Brakes – Excellent brakes. Lever and pedal had a positive feel and worked well under light pressure. Rear brake pedal is located low and can affect rider's foot position.

Cornering/Handling – Lean angle through corners could be improved, easy to drag the outside edge of rider's boot and foot pegs. Holds line good through the corners.

Transmission (Shift Points) – Evenly spaced gearing with no missed shifts.

Engine – Good smooth power throughout the rpm range. Seemed happier at higher rpm's.

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 KAWASAKI CONCOURS 14 ABS

RIDER	TOTAL TIME	AVG. SPEED
Officer B. Wilson, LAPD	4:30.16	32.8
Officer M. Nowlen, LAPD	4:19.22	34.2

ITEM	RATING**
STEERING	8
LEAN ANGLE	8
SUSPENSION	8.5
BRAKE FADE	10
BRAKE PULL	9
ABS OPERATION	9

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS

Brakes – Brake reaction from rider input was solid and consistent. Brakes very predictable with no fade.

Cornering/Handling – Good lean angle throughout the corners. Bikes tends to push during extreme side to side transitions.

Transmission (Shift Points) – Smooth shifts with no missed gears. Felt 1st gear ran out of rpm too soon, majority of the course was done in second gear.

Engine – Strong and pulled very well throughout the rpm range.

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 VICTORY COMMANDER 1

RIDER	TOTAL TIME	AVG. SPEED
Deputy M. Brown, LASD	4:43.03	31.3
Officer M. Nowlen, LAPD	4:32.18	32.5

ITEM	RATING**
STEERING	7
LEAN ANGLE	6.5
SUSPENSION	8
BRAKE FADE	7.5
BRAKE PULL	7.5
ABS OPERATION	8.5

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS

Brakes – Brake activation slow with a spongy feel. Slight fade. ABS operation smooth.

Cornering/Handling – Tracked smooth through the corners. Lean angle average, drags floorboards through the turns.

Transmission (Shift Points) – Smooth shifts with no missed gears.

Engine – Strong and pulled very well throughout the rpm range.

PURSUIT COURSE MOTORCYCLE DYNAMICS EVALUATION

2012 VICTORY VISION

RIDER	TOTAL TIME	AVG. SPEED
Deputy M. Brown, LASD	4:45.34	31.0
Officer M. Nowlen, LAPD	4:33.85	32.3

ITEM	RATING**
STEERING	7
LEAN ANGLE	6
SUSPENSION	8
BRAKE FADE	7.5
BRAKE PULL	7
ABS OPERATION	8

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

DRIVER COMMENTS

Brakes – Brakes activate quick. Feedback through the brake controls felt spongy under hard braking. Slight fade.

Cornering/Handling – Smooth cornering ability. Runs out of lean angle quick resulting in floorboard and front engine guard drag.

Transmission (Shift Points) – Gear changes quick and positive with no missed shifts. Gearing is evenly spaced for good acceleration and performance.

Engine – Solid power all the way to redline. Pulls hard out of turns and down the straightaways.

BRAKING

DEBRIS FIELD BRAKING
SANDY SURFACE – 40 MPH TO ZERO

2011 BMW R 1200 RT-P	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	110.60 feet

2012 KAWSAKI CONCOURS 14 ABS	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	114.9 feet

2012 HARLEY-DAVIDSON ELECTRA GLIDE	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	95.7 feet

2012 HARLEY-DAVIDSON ROAD KING	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	86.0 feet

2011 HONDA ST 1300-PA	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	95.8 feet

2012 VICTORY VISION	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	108.4

2012 VICTORY COMMANDER	
RIDER	STOPPING DISTANCE
Deputy M. Brown, LASD	103.5

TRANSITORY BRAKING
DRY TO WET - 40 MPH TO ZERO

2011 BMW R 1200RT-P	
Officer M. Nowlen, LAPD	60.9 feet

2012 KAWASAKI CONCOURS 14 ABS	
RIDER	DRY TO WET STOP
Officer M. Nowlen, LAPD	63.1 feet

2012 HARLEY-DAVIDSON ELECTRA GLIDE	
RIDER	DRY TO WET STOP
Officer M. Nowlen, LAPD	67.6 feet

2012 HARLEY-DAVIDSON ROAD KING	
RIDER	DRY TO WET STOP
Officer M. Nowlen, LAPD	58.2 feet

2011 HONDA ST 1300-PA	
RIDER	DRY TO WET STOP
Officer M. Nowlen, LAPD	67.2 feet

2012 VICTORY VISION	
RIDER	DRY TO WET STOP
Officer M. Nowlen, LAPD	69.5 feet

2012 VICTORY COMMANDER 1	
RIDER	DRY TO WET STOP
Deputy M. Brown, LASD	78.0 feet

HARD BRAKING **60 MPH TO ZERO**

2011 BMW R 1200 RT-P	
Braking Distance	138.2 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2012 KAWASAKI CONCOURS 14 ABS	
Braking Distance	144.7 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2012 HARLEY-DAVIDSON ELECTRA GLIDE	
Braking Distance	154.3 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2012 HARLEY-DAVIDSON ROAD KING	
Braking Distance	126.4 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2011 HONDA ST 1300-PA	
Braking Distance	143.5 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2012 VICTORY VISION	
Braking Distance	147.4 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

2012 VICTORY COMMANDER 1	
Braking Distance	148.1 feet @ 60.0 MPH
Evidence of Severe Fading Prior to Stopping?	NO
Did the Bike Stop in a Straight Line?	YES

ERGONOMICS

157 MILE RIDE

ERGONOMICS EVALUATION SUBJECTIVE **EVALUATION – 157 MILE RIDE**

2011 BMW R 1200 RT-P

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	9
Seat Position	Range of Adjustment	9
Riding Position	Lean Angle, Comfort	8.6
Floorboards / Pegs	Access to Foot Controls	8.3
RIDER COMMENTS		
<p>The seat’s padding and width was sufficient to provide all day comfort. Seat is adjustable with a “lean forward” seating position. Foot pegs, toe shifter and brake lever are well positioned and easy to use. Riding posture was comfortable for a full shift of riding.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	8.6
Visibility	Instruments	7.3
Reflection / Glare	Windshield, Instruments	8
Instruments	Adequacy, Legibility	7.3
RIDER COMMENTS		
<p>The instrument panel is easy to read with analog and digital displays. The digital readouts for fuel, temperature and speed are user friendly but become hard to read or not visible depending on the light and riders protective eyewear.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	8.3
Reflections	Instruments, Controls	8.6
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	8.6
Mirror Location	Accessibility, Visibility, Obstruction	8.6
RIDER COMMENTS		
<p>Mirrors are mounted on the outer lower edge of the fairing and provide adequate visibility with no distortion. The ends of the handle bars obstruct the top most portion of both mirrors.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	9
Adjustability	Electric or Manual, Ease of Use	9
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	8.6
RIDER COMMENTS		
<p>The windscreen provided good wind and debris protection with a wide range of height adjustments to fit the rider's needs. There was little to no "bifocal effect" noted on the top edge of the windscreen.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	8.6
Shift Levers	Usability, Shift Pad Position	9
Switches	Reach, Markings, Visibility, Accessibility	8.3
Rear Brake Pedal	Location, Feedback, Ease of Use	9
Front Brake Lever	Location, Feedback, Adjustability	9
Clutch Lever	Lever Resistance, Adjustability	9.6
RIDER COMMENTS		
<p>The handlebar width is wide with a high rise angle which offers good leverage when rotating handlebars side to side. The handlebar switches are within easy reach and are marked with universal symbols. Shift lever and brake pedal are well positioned. Front brake lever and clutch lever are adjustable for reach and provide excellent rider feedback.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	7
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	8.6
Lean Angle	Side Stand of Adequate Length	9
RIDER COMMENTS		
<p>The foot pegs are comfortably positioned to offer good control and support long riding days. The trunk is noticeably high in relation to the rider requiring a high leg swing to get on /off. The foot pegs are positioned inward and do not interfere with mount/dismount. The length of the side stand provided adequate motorcycle lean angle when parked.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	9
Rider Size	Adjustability	8.6
RIDER COMMENTS		
<p>The ride quality and comfort was exceptionally smooth. The damping and rebound characteristics of the suspension smoothed out all but the roughest roadway conditions. Rear shock absorber rebound and preload are rider adjustable.</p>		

STORAGE	CONSIDERATIONS	RATING
Saddlebags	Angle, Size and Position of Opening	8.6
Locks	Same Key, Security, Sturdiness	9
RIDER COMMENTS		
<p>Saddlebag storage size is adequate. The saddlebags are mounted slightly forward and close to the seat, which reduces the room for the equipment belt. The saddlebags open from the top, hinge forward, and provide a watertight seal when closed.</p>		

ADDITIONAL RIDER COMMENTS
<p>The motorcycle offers the combination of long distance comfort and remarkable handling capabilities to the modern day enforcement officer.</p>

ERGONOMICS EVALUATION SUBJECTIVE **EVALUATION – 157 MILE RIDE**

2012 KAWASKI CONCOURS 14 ABS

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	4
Seat Position	Range of Adjustment	N/A
Riding Position	Lean Angle, Comfort	5
Floorboards / Pegs	Access to Foot Controls	7.6
RIDER COMMENTS		
<p>The “Corbin” seat was frame mounted and not adjustable. The seat has very little padding which resulted in an uncomfortable ride during extended riding periods. Riding position is center on the motorcycle with the upper body leaned forward over the gas tank. Arms are extended forward and down with the rider looking up to achieve a high horizontal field of view. Access to the foot pegs, shifter and brake lever was good.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	7.6
Visibility	Instruments	7.6
Reflection / Glare	Windshield, Instruments	6.6
Instruments	Adequacy, Legibility	7.3
RIDER COMMENTS		
<p>The gauges were easy to read. There was minor glare with changing light conditions making them more difficult to read. All the switches were easy to reach.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	7.3
Reflections	Instruments, Controls	7.6
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	7
Mirror Location	Accessibility, Visibility, Obstruction	7.6
RIDER COMMENTS		
<p>The fairing mounted, fold away convex mirrors provided a clear, wide angle view of traffic behind the motorcycle. The tops of the saddlebags were visible in the bottom of each mirror. The mirrors were vibration free and there were no visible distortions.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	5
Adjustability	Electric or Manual, Ease of Use	8
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	8
RIDER COMMENTS		
<p>The windscreen is narrow and adjustable via a thumb switch. The screen is low, even in the full up position, which causes slight helmet buffeting and turbulence at freeway speeds.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	5.3
Shift Levers	Usability, Shift Pad Position	8
Switches	Reach, Markings, Visibility, Accessibility	8
Rear Brake Pedal	Location, Feedback, Ease of Use	8
Front Brake Lever	Location, Feedback, Adjustability	8
Clutch Lever	Lever Resistance, Adjustability	7.6
RIDER COMMENTS		
<p>The handlebars are spaced shoulder width apart and positioned well forward over the front of the gas tank. This forces the rider into a bent over riding position, placing a lot of downward pressure on the arms and hands. Gear shift lever is placed in a natural position, providing plenty of room for both up and down shifting. Switches are big enough to allow the rider quick manipulation. Both the clutch and front brake levers were mounted in close proximity to the grips and provide a wide range of adjustment.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	6.6
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	8.3
Lean Angle	Side Stand of Adequate Length	8.6
RIDER COMMENTS		
<p>The trunk is noticeably high in relation to the driver, requiring a high leg swing to get on and off. Foot pegs are wide and positioned well. The side stand is positioned just behind the left foot peg and difficult to deploy quickly. The length of the side stand provided adequate lean angle.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	5
Rider Size	Adjustability	6.3
RIDER COMMENTS		
<p>The front and rear suspensions are adjustable. Even in the softest setting the bike had a firm ride.</p>		

STORAGE	CONSIDERATIONS	RATING
Saddlebags	Angle, Size and Position of Opening	6.3
Locks	Same Key, Security, Sturdiness	7.6
RIDER COMMENTS		
<p>The saddlebags open clamshell style and are very large. This significantly adds to the width of the rear of the motorcycle. The ignition key operates the saddlebag locks providing good security and sturdiness. The saddlebags can only be opened using a key. The key cannot be removed from the saddlebag lock while it in the opened position. The inner saddlebag storage and outer saddlebag lid storage was divided by an elastic cross strap.</p>		

ADDITIONAL RIDER COMMENTS
<p>The motorcycle has great acceleration and braking performance but has a surprisingly heavy bar feel when inputting counter steer. The motorcycle is really wide and a lot of work to maneuver in and around heavy traffic, on city streets. Difficult to split lanes. Adding a taller windshield, making some suspension improvements, and moving the handlebars back towards the rider would be very welcome improvements.</p>

ERGONOMICS EVALUATION SUBJECTIVE **EVALUATION – 157 MILE RIDE**

2012 HARLEY DAVIDSON ELECTRA GLIDE

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	7
Seat Position	Range of Adjustment	6
Riding Position	Lean Angle, Comfort	7
Floorboards / Pegs	Access to Foot Controls	7
RIDER COMMENTS		
<p>The seat is firm, but not hard. Seat contains an air bladder which can be adjusted for rider comfort. The riding position is upright and bent forward at the hip. The floorboards are placed to support an upright riding position. The foot controls are well placed.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	7
Visibility	Instruments	7
Reflection / Glare	Windshield, Instruments	7
Instruments	Adequacy, Legibility	6
RIDER COMMENTS		
<p>The instrument panel is configured with large dials for speedo and tach but only has a small display for fuel, turn signals, and high beams indicators. The lighted display was dim and hard to read in the bright sunlight.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	5
Reflections	Instruments, Controls	6.6
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	4.3
Mirror Location	Accessibility, Visibility, Obstruction	7
RIDER COMMENTS		
<p>Visibility is good due to the small size of the windshield. It is very easy to look over the top and around the side. Mirror location is good but are small and do not provide the rider with much for a field of view. Convex mirror would be better. The mirrors vibrated on the freeway and at idle which caused the view to become distorted.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	5.3
Adjustability	Electric or Manual, Ease of Use	N/A
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	8.3
RIDER COMMENTS		
<p>The windscreen is rounded at the top and hard mounted to the fairing. The fairing and windshield combination provided adequate protection at freeway speeds.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	7.6
Shift Levers	Usability, Shift Pad Position	7
Switches	Reach, Markings, Visibility, Accessibility	7.6
Rear Brake Pedal	Location, Feedback, Ease of Use	8
Front Brake Lever	Location, Feedback, Adjustability	7
Clutch Lever	Lever Resistance, Adjustability	7
RIDER COMMENTS		
<p>All controls and switches are user friendly, positioned well and easily accessible. The clutch lever pull is rather heavy, but the brake and shift levers are smooth and decisive. The handlebars are positioned forward resulting in a “stretched arm” feel while the rider sits centered on the motorcycle, this consequently affected the rider’s posture negatively. The heel toe shifter was in a good location and very easy to use. The rear brake pedal is mounted forward of the floorboard. When using it, the rider found that he had to pick up his whole foot from the floorboard rather than being able to just pivot on the heel.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	N/A
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	8
Lean Angle	Side Stand of Adequate Length	8
RIDER COMMENTS		
<p>It is very easy to mount or dismount the motorcycle from either side. Footboards were comfortable and provided the rider with plenty of room to adjust their foot position. Side stand length provided a good lean angle to securely park the motorcycle.</p>		

ERGONOMICS EVALUATION SUBJECTIVE EVALUATION – 157 MILE RIDE

2012 HARLEY-DAVIDSON ROAD KING

**Rating Scale 1 – 10 / 1 -Poor / 5 – Average / 10 - Outstanding

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	7
Seat Position	Range of Adjustment	6
Riding Position	Lean Angle, Comfort	7
Floorboards / Pegs	Access to Foot Controls	7
RIDER COMMENTS		
<p>The seat is comfortable especially with the added air cushion feature making it adjustable to rider's preference. The rider's position aboard the motorcycle although comfortable on extended rides with minimal shifting or braking, makes the rider feel stretched both in legs and arms. The footboards and foot controls are extended forward with a slight angle back. Position felt awkward at slower speeds. Floorboards are close to the ground with minimal road clearance when lean angles are input in the handlebars.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	7
Visibility	Instruments	4
Reflection / Glare	Windshield, Instruments	7
Instruments	Adequacy, Legibility	5
RIDER COMMENTS		
<p>The control switches are accessible to the rider while hands are holding on to the handlebars and are clearly displayed and visible. The tank mounted dials (speedometer and gas gauge) would be better suited if mounted higher to prevent the rider from looking down to monitor his speed or gauge his fuel consumption. The instrument indicators are legible but they are small and hard to see in the bright sunlight.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	6
Reflections	Instruments, Controls	8
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	6
Mirror Location	Accessibility, Visibility, Obstruction	7
RIDER COMMENTS		
<p>The mirrors are extended from the handlebars and provide good visibility of rear traffic, especially while operating on freeway conditions with minimal vibration; however vibration is more prominent in normal stop and go traffic and distorts the visibility considerably. Visibility is good due to the small size of the windshield.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	5
Adjustability	Electric or Manual, Ease of Use	N/A
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	9
RIDER COMMENTS		
<p>The windshield is small giving you minimal wind protection especially on the freeway. The rider has clear view over the top of the windshield due to its size. Protection is adequate for warmer days. Lots of buffeting at higher speeds, lots of wind noise.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	8
Shift Levers	Usability, Shift Pad Position	7
Switches	Reach, Markings, Visibility, Accessibility	9
Rear Brake Pedal	Location, Feedback, Ease of Use	8
Front Brake Lever	Location, Feedback, Adjustability	7
Clutch Lever	Lever Resistance, Adjustability	7
RIDER COMMENTS		
<p>The handlebars and footboards position causes the rider to sit astride the motor with arms and legs stretched forward resulting in a less than comfortable riding posture especially on the lower back. Floorboards and foot controls would be better suited if positioned back with less strain on hips and lower back. They also take away some of the footboard space. The front brake lever and clutch lever were of good size and easy to use. The clutch pull was firm.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	N/A
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	8
Lean Angle	Side Stand of Adequate Length	8
RIDER COMMENTS		
<p>This test bike did not come equipped with a top box thus boarding the motor was effortless. The motor has a low center of gravity and allows for limited lean angle inputs or the rider will drag the boards on road surface. The side stand was easily accessible by the rider.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	7
Rider Size	Adjustability	N/A
RIDER COMMENTS		
<p>The motorcycle's quality of ride was comfortable in the saddle due to the bike's air ride assisted suspension with minimal road irregularities transferred to the rider. The suspension offered a very firm quality of ride.</p>		

ERGONOMICS EVALUATION SUBJECTIVE EVALUATION – 157 MILE RIDE

2011 HONDA ST 1300-PA

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	7
Seat Position	Range of Adjustment	7
Riding Position	Lean Angle, Comfort	7
Floorboards / Pegs	Access to Foot Controls	8
RIDER COMMENTS		
<p>The seat is shaped well and has sufficient padding. The seat has three settings for height adjustment. The seat was firm, provided good support, and did not become objectionable. Riding position lean angle is slightly forward putting the handlebars within easy reach. Access to the toe shifter and rear brake control felt natural and was easy to operate.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	8
Visibility	Instruments	8
Reflection / Glare	Windshield, Instruments	8
Instruments	Adequacy, Legibility	8
RIDER COMMENTS		
<p>The instrument panel is configured on the fairing, well within proximity of the rider's view making it easy to refer to at a glance. The digital display is centrally located on the instrument cluster. Having a gear indicator display would be a nice feature.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	9
Reflections	Instruments, Controls	8
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	8
Mirror Location	Accessibility, Visibility, Obstruction	8
RIDER COMMENTS		
<p>Although the motorcycle's mirrors are positioned low causing the rider to lower his head and eyes to view, they provide a clear and wide reflection with no noticeable vibration distorting the image reflecting. The mirrors are easily adjustable.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	9
Adjustability	Electric or Manual, Ease of Use	9
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	8
RIDER COMMENTS		
<p>The windscreen is electrically operated and can be adjusted quickly to the changing riding conditions. The rider is well protected from the wind and roadway debris. The windscreen deflects the wind around the rider with no turbulence or buffeting. Very good clarity with no visual distortion.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	8
Shift Levers	Usability, Shift Pad Position	8
Switches	Reach, Markings, Visibility, Accessibility	8
Rear Brake Pedal	Location, Feedback, Ease of Use	8
Front Brake Lever	Location, Feedback, Adjustability	8
Clutch Lever	Lever Resistance, Adjustability	8
RIDER COMMENTS		
<p>The handlebars were adjusted with bar risers and were extended high enough to be comfortable on long rides yet forward enough to maintain good riding position. The foot shifter is mounted low in relationship to the left foot peg. Switches are within quick reach and clearly labeled. Both the clutch and front brake levers are adjustable with the standard rotary knob. Brakes have smooth application with good feedback to the rider.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	8
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	8
Lean Angle	Side Stand of Adequate Length	8
RIDER COMMENTS		
<p>Trunk height on the Honda was not objectionable. There was ample leg swing room while mounting and dismounting from either side of the bike. The foot pegs did not interfere at all. Side stand length was adequate to safely support the motorcycle at a proper lean angle.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	8
Rider Size	Adjustability	7
RIDER COMMENTS		
The overall quality of the ride is good although the suspension is moderately stiff but still provides good roadway feedback.		

STORAGE	CONSIDERATIONS	RATING
Saddlebags	Angle, Size and Position of Opening	7
Locks	Same Key, Security, Sturdiness	7
RIDER COMMENTS		
The saddlebags are not equipped with dividers but provide adequate storage space for equipment and storage items easily secured with lock.		

ADDITIONAL RIDER COMMENTS
Motorcycle was easy to mount and sat at a nice height. Very agile and maneuverable, felt comfortable to ride. Adjustments to the suspension to smooth out roadway imperfections and top opening saddlebags designed to better handle patrol gear would be welcome improvements

ERGONOMICS EVALUATION SUBJECTIVE EVALUATION – 157 MILE RIDE

2012 VICTORY VISION

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	7.6
Seat Position	Range of Adjustment	N/A
Riding Position	Lean Angle, Comfort	7.6
Floorboards / Pegs	Access to Foot Controls	7.6
RIDER COMMENTS		
<p>The seat is well padded and mounted to the frame with no adjustment. The seat was equipped with a lower back support. Rider has plenty of room to move and adjust foot position. Seating position was slightly leaned back against the back support with legs extended forward, feet flat on the floorboards.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	7
Visibility	Instruments	7.3
Reflection / Glare	Windshield, Instruments	8
Instruments	Adequacy, Legibility	7
RIDER COMMENTS		
<p>The instrument panel was nicely configured into the large fairing with large dials for the speedometer and tachometer. Panel was clearly visible with very little reflection.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	7
Reflections	Instruments, Controls	7.6
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	7.6
Mirror Location	Accessibility, Visibility, Obstruction	8
RIDER COMMENTS		
<p>The mirrors are mounted on the handlebars and are positioned above each handgrip. The mirrors are adjustable and provide an adequate view to the side and rear of the motorcycle. Little to no vibration.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	8
Adjustability	Electric or Manual, Ease of Use	8.3
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	8
RIDER COMMENTS		
<p>The windscreen is adjustable through an easy to reach electric switch. The fairing and windshield combination provide excellent wind and debris protection for the rider.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	7.6
Shift Levers	Usability, Shift Pad Position	7
Switches	Reach, Markings, Visibility, Accessibility	7.1
Rear Brake Pedal	Location, Feedback, Ease of Use	7.6
Front Brake Lever	Location, Feedback, Adjustability	7
Clutch Lever	Lever Resistance, Adjustability	7.1
RIDER COMMENTS		
<p>The handlebars are long and swept back to the rider. The position is good for cruising but can be challenging when negotiating tight maneuvers in city and urban environments. The foot controls are mounted well within reach in the upright seating position. The front brake lever and clutch lever are within easy reach and provide good rider feedback. The handlebar switches are well marked and easy to operate.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	5
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	6.5
Lean Angle	Side Stand of Adequate Length	7
RIDER COMMENTS		
<p>Getting on and off this motorcycle in enforcement mode is difficult due to the high top box. The floorboards were comfortable and provided the rider with plenty of room to adjust their foot position. Side stand length provided a good lean angle.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	7
Rider Size	Adjustability	6
RIDER COMMENTS		
The motorcycle was very easy to control even while riding over more severe road conditions. The suspension was solid and predictable in the corners.		

STORAGE	CONSIDERATIONS	RATING
Saddlebags	Angle, Size and Position of Opening	5.6
Locks	Same Key, Security, Sturdiness	8.3
RIDER COMMENTS		
The low position and small size of the saddle bags would present a challenge for enforcement motorcycle duties. The saddle bag lids open outward to provide quick easy access.		

ADDITIONAL RIDER COMMENTS
The Vision is physically very large and heavy. It is surprisingly nimble for its size and weight.

ERGONOMICS EVALUATION SUBJECTIVE
EVALUATION – 157 MILE RIDE

2012 VICTORY COMMANDER 1

RIDING POSITION	CONSIDERATIONS	RATING
Seat Comfort	Padding, Springs, Width	7.6
Seat Position	Range of Adjustment	N/A
Riding Position	Lean Angle, Comfort	7
Floorboards / Pegs	Access to Foot Controls	8
RIDER COMMENTS		
<p>The seat is well padded and mounted to the frame with no adjustment. The seat was equipped with a lower back support. Rider has plenty of room to move and adjust foot position. Seating position was slightly leaned back against the back support with legs extended forward, feet flat on the floorboards.</p>		

INSTRUMENT PANEL	CONSIDERATIONS	RATING
Controls	Position, Usability	7.6
Visibility	Instruments	7.6
Reflection / Glare	Windshield, Instruments	8
Instruments	Adequacy, Legibility	8
RIDER COMMENTS		
<p>The instrument panel was nicely configured into the large fairing with large dials for the speedometer and tachometer and a digital display which informs the rider of everything from air temperature to gear selection and fuel mileage. Panel was clearly visible with very little reflection.</p>		

MIRRORS	CONSIDERATIONS	RATING
Road Visibility	Distortion, Obstruction	7
Reflections	Instruments, Controls	7.6
Mirror Coverage	Adjustment, Rear Visibility, Flat or Convex	8
Mirror Location	Accessibility, Visibility, Obstruction	8
RIDER COMMENTS		
<p>The mirrors are mounted up and out of the way. They are very easy to refer to at a glance and provide a good view to both sides. Little to no vibration and hold position well.</p>		

WIND SCREEN	CONSIDERATIONS	RATING
Height / Width	Wind / Debris Protection	7
Adjustability	Electric or Manual, Ease of Use	N/A
Top Edge	Clear View Over Top of Windshield, (Bifocal Effect)	6.6
RIDER COMMENTS		
<p>The windscreen is slightly higher than eye level, rounded at the top and hard mounted to the handlebar fairing. It provides good protection from wind and debris at all speeds. Some helmet buffeting was experienced at higher highway speeds.</p>		

CONTROLS	CONSIDERATIONS	RATING
Handlebars	Angle, Size, Position	7.6
Shift Levers	Usability, Shift Pad Position	7
Switches	Reach, Markings, Visibility, Accessibility	7.6
Rear Brake Pedal	Location, Feedback, Ease of Use	8
Front Brake Lever	Location, Feedback, Adjustability	7
Clutch Lever	Lever Resistance, Adjustability	7
RIDER COMMENTS		
<p>The handlebars are positioned up and back slightly keeping the rider in an upright position. Handlebars have good leverage with average side to side movement. The foot controls are mounted well within reach and use of the upright seated position. The hand controls are solid and provide the rider with good feedback.</p>		

MOUNT / DISMOUNT	CONSIDERATIONS	RATING
Trunk Height	Ample Leg Swing Room	6
Foot Peg / Floorboard	Interferes With Mounting / Dismounting	7
Lean Angle	Side Stand of Adequate Length	7
RIDER COMMENTS		
<p>The leg swing over the mounted top box was not extreme and did not require exerted effort to mount the motorcycle. Side stand length provided a good lean angle to securely park the motorcycle.</p>		

SUSPENSION	CONSIDERATIONS	RATING
Quality of Ride	Dampening, Rebound	8
Rider Size	Adjustability	6
RIDER COMMENTS		
The ride was comfortable and smooth at all speeds. The motorcycle was easy to control even when riding over more severe riding conditions.		

STORAGE	CONSIDERATIONS	RATING
Saddlebags	Angle, Size and Position of Opening	7
Locks	Same Key, Security, Sturdiness	7
RIDER COMMENTS		
The saddle bags are large and provide ample space for storage. The lids open outwards to provide quick easy access.		

ADDITIONAL RIDER COMMENTS
The motorcycle was smooth and predictable during the day's ride. The comfort of the ride was very good.

ACCELERATION & FUEL EFFICIENCY

ACCELERATION EVALUATION

SPEED	BMW R1200 RT-P	HD – ELECTRA GLIDE	HONDA ST1300 PA
0-30 MPH	1.77	1.89	2.16
0-60 MPH	4.85	5.58	4.42
0-100 MPH	12.05	19.32	11.17
30-60 MPH	2.91	3.86	2.72
60-100 MPH	6.97	18.59	6.38
¼ MILE	13:52 @ 104.88	14.70 @ 88.70	13.12 @ 106.30

SPEED	KAWASAKI CONCOURS	HD – ROAD KING GLIDE	VICTORY VISION
0-30 MPH	2.59	1.97	2.19
0-60 MPH	4.33	5.48	6.03
0-100 MPH	8.84	21.68	20.06
30-60 MPH	2.04	3.54	3.69
60-100 MPH	4.20	15.17	13.06
¼ MILE	12.65 @ 117.04	14.52 @ 91.00	14.74 @ 92.96

SPEED	VICTORY COMMANDER 1		
0-30 MPH	2.78		
0-60 MPH	6.48		
0-100 MPH	20.64		
30-60 MPH	4.32		
60-100 MPH	13.29		
¼ MILE	15.20 @ 90.58		

FUEL EFFICIENCY EVALUATION

MOTORCYCLE	COMBINED AVERAGE Three 157 Mile Loops
2011 BMW R1200 RT-P	40.0 MPG
2012 KAWASKI CONCOURS 14 ABS	30.9 MPG
2012 HARLEY DAVIDSON ELECTRA GLIDE	33.9 MPG
2012 HARLEY DAVIDSON ROAD KING	40.2 MPG
2011 HONDA ST-1300 PA	36.7 MPG
2012 VICTORY VISION	36.7 MPG
2012 VICTORY COMMANDER 1	37.5 MPG

HEAT EVALUATION

HEAT EVALUATION
IMMEDIATELY FOLLOWING 32 LAP COURSE

2011 BMW R 1200 RT-P		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water	N/A	N/A
Engine Oil	260° to 300°	Pass
Transmission Oil	N/A Part of the engine case	N/A
RADIANT HEAT		
Radiator	N/A	
Brake Rotors	Front-195° Rear-187°	
Engine	263°	
Transmission	200°	
Exhaust	184°	

2012 KAWASAKI CONCOURS 14 ABS		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water	180° to 220°	Pass
Engine Oil	180° to 250°	Pass
Transmission Oil	N/A Part of the engine case	N/A
RADIANT HEAT		
Radiator	163°	
Brake Rotors	Front-193° Rear-165°	
Engine	199°	
Transmission	N/A	
Exhaust	210°	

2012 HARLEY-DAVIDSON ELECTRA GLIDE		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water	N/A	N/A
Engine Oil	280° to 410°	Pass
Transmission Oil	N/A Part of the engine case	Pass
RADIANT HEAT		
Oil Cooler	197°	
Brake Rotors	Front-176° Rear-100°	
Engine	299°	
Transmission	252°	
Exhaust	147°	

2012 HARLEY-DAVIDSON ROAD KING		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water	N/A	N/A
Engine Oil	280° to 410°	Pass
Transmission Oil	N/A Part of the engine case	Pass
RADIANT HEAT		
Oil Cooler	142°	
Brake Rotors	Front-139° Rear-139°	
Engine	284°	
Transmission	248°	
Exhaust	114°	

2011 HONDA ST 1300-PA		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water	208° to 216° Max.	Pass
Engine Oil	176° to 248° Max.	Pass
Transmission Oil	N/A Part of the engine case	N/A
RADIANT HEAT		
Radiator	194°	
Brake Rotors	Front-260° Rear-311°	
Engine	200°	
Transmission	N/A	
Exhaust	298°	

2012 VICTORY COMMANDER 1		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water		N/A
Engine Oil	Minimum 180°	Pass
Transmission Oil	Minimum 180°	Pass
RADIANT HEAT		
Oil Cooler	223°	
Brake Rotors	Front-140° Rear-220°	
Engine	192°	
Transmission	247°	
Exhaust	273°	

2012 VICTORY VISION		
ITEM	MANUFACTURERS RECOMMENDATION	TEST RESULT
Radiator Water		N/A
Engine Oil	Minimum 180°	Pass
Transmission Oil	Minimum 180°	Pass
RADIANT HEAT		
Oil Cooler	185°	
Brake Rotors	Front-141° Rear-257°	
Engine	253°	
Transmission	241°	
Exhaust	188°	

SOUND LEVEL EVALUATION

SOUND LEVEL EVALUATION

2011 BMW R 1200 RT-P	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	83.5dB
60 MPH (Sustained Speed)	87.9dB
80 MPH (Sustained Speed)	95.9dB
Accelerate zero to 80 mph	99.7dB

2012 KAWASAKI CONCOURS 14 ABS	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	86.1dB
60 MPH (Sustained Speed)	90.2dB
80 MPH (Sustained Speed)	96.5dB
Accelerate zero to 80 mph	110.0dB

2012 HARLEY DAVIDSON ELECTRA GLIDE	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	89.5dB
60 MPH (Sustained Speed)	92.0dB
80 MPH (Sustained Speed)	93.9dB
Accelerate zero to 80 mph	96.0dB

2012 HARLEY DAVIDSON ROAD KING	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	88.4dB
60 MPH (Sustained Speed)	99.4dB
80 MPH (Sustained Speed)	101.9dB
Accelerate zero to 80 mph	109.2dB

2011 HONDA ST 1300-PA	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	85.1dB
60 MPH (Sustained Speed)	86.9dB
80 MPH (Sustained Speed)	96.2dB
Accelerate zero to 80 mph	98.7dB

2012 VICTORY VISION	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	83.6dB
60 MPH (Sustained Speed)	90.0dB
80 MPH (Sustained Speed)	90.3dB
Accelerate zero to 80 mph	106.4dB

2012 VICTORY COMMANDER 1	
SPEED	MEASURED dB
40 MPH (Sustained Speed)	86.5dB
60 MPH (Sustained Speed)	90.2dB
80 MPH (Sustained Speed)	98.5dB
Accelerate zero to 80 mph	106.8dB

MECHANICAL EVALUATION

MECHANICAL EVALUATION

2011 BMW R 1200 RT-P

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	6
Alternator	Accessibility, Amperage	4
Stator	Accessibility, Amperage	5
Starter	Accessibility, Power	6
Ignition	Accessibility	6
Spark Plugs	Accessibility	6
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	6
Fuse Box	Accessibility, Serviceability	7
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	6
Fuel Pump	Accessibility, Serviceability	6
Fuel Filter	Accessibility, Serviceability	6
Fuel Tank / Lines	Accessibility, Puncture Resistant	6
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	N/A
Water Pump	Accessibility, Belt Arrangement	N/A
Hoses	Accessibility	N/A
Coolant Recovery	Accessibility, Capacity	N/A
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	2
Drain Plug	Ease of Removal, Protection	6
Fluid Level Sight Glass	Accessibility, Night Usability	4
Clutch	Accessibility, Serviceability	4
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	6
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	7
Rear Wheel Brakes	Accessibility	7
ABS System	Accessibility, Serviceability, Reparability	6
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Catalytic Converter	Accessibility, Protection	6
Muffler	Accessibility	7
Pipes	Accessibility, Support	6
Header Pipes	Accessibility, Protection	6

MECHANICAL EVALUATION

BMW R 1200 RT-P - Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	7
Crash Bars	Accessibility, Ease of Removal	6
Patrol Equipment, Lights	Ease of Installation	5
Instrument Panels	Accessibility, Serviceability	6
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	6
Body Panels	Ease of Removal	6
Handlebar Controls	Accessibility, Serviceability, Protection	6
Foot Controls	Accessibility, Serviceability, Protection	6
Saddlebags	Accessibility, Protection	6
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	4
Cylinder Head	Accessibility, Ease of Removal	7
Valve Covers	Accessibility, Valve Train Serviceability	7
Cylinder Removal	Accessibility, Serviceability,	7
Drain Plug	Ease of Removal, Durability	7
Fluid Level Sight Glass	Accessibility, Night Usability	6
Oil Filter	Accessibility, Capacity, Protection	7
Engine Mounts	Accessibility	4
Oil Coolers	Accessibility, Protection	7
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	6
Front Suspension	Accessibility, Serviceability	6
Rear Shock Absorbers	Accessibility, Serviceability	6
Rear Swing Arm	Accessibility, Serviceability	6
Front Tire	Accessibility, Ease of Removal	6
Axle Bearings & Seals	Accessibility, Serviceability	6
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	6
Drive Chain	Accessibility, Serviceability	N/A
Axle Bearings & Seals	Accessibility, Serviceability	N/A
Drive Shaft	Accessibility, Serviceability	6
Universal Joints	Accessibility, Serviceability	6
Rear Tire	Accessibility, Ease of Removal	8

MECHANICAL EVALUATION

2012 KAWASAKI CONCOURS 14 ABS

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	4
Alternator	Accessibility, Amperage	N/A
Stator	Accessibility, Amperage	4
Starter	Accessibility, Power	3
Ignition	Accessibility	3
Spark Plugs	Accessibility	3
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	6
Fuse Box	Accessibility, Serviceability	6
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	5
Fuel Pump	Accessibility, Serviceability	6
Fuel Filter	Accessibility, Serviceability	6
Fuel Tank / Lines	Accessibility, Puncture Resistant	6
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	7
Water Pump	Accessibility, Belt Arrangement	7
Hoses	Accessibility	7
Coolant Recovery	Accessibility, Capacity	7
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	3
Drain Plug	Ease of Removal, Protection	10
Fluid Level Sight Glass	Accessibility, Night Usability	5
Clutch	Accessibility, Serviceability	6
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	5
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	5
Rear Wheel Brakes	Accessibility	5
ABS System	Accessibility, Serviceability, Reparability	5
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Catalytic Converter	Accessibility, Protection	N/A
Muffler	Accessibility	7
Pipes	Accessibility, Support	6
Header Pipes	Accessibility, Protection	6

MECHANICAL EVALUATION
KAWASAKI CONCOURS 14 ABS - Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	9
Crash Bars	Accessibility, Ease of Removal	8
Patrol Equipment, Lights	Ease of Installation	5
Instrument Panels	Accessibility, Serviceability	5
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	4
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	6
Foot Controls	Accessibility, Serviceability, Protection	6
Saddlebags	Accessibility, Protection	6
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	5
Cylinder Head	Accessibility, Ease of Removal	4
Valve Covers	Accessibility, Valve Train Serviceability	3
Cylinder Removal	Accessibility, Serviceability,	3
Drain Plug	Ease of Removal, Durability	7
Fluid Level Sight Glass	Accessibility, Night Usability	8
Oil Filter	Accessibility, Capacity, Protection	8
Engine Mounts	Accessibility	6
Oil Coolers	Accessibility, Protection	N/A
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	5
Front Suspension	Accessibility, Serviceability	5
Rear Shock Absorbers	Accessibility, Serviceability	5
Rear Swing Arm	Accessibility, Serviceability	5
Front Tire	Accessibility, Ease of Removal	5
Axle Bearings & Seals	Accessibility, Serviceability	5
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	5
Drive Chain	Accessibility, Serviceability	N/A
Axle Bearings & Seals	Accessibility, Serviceability	5
Drive Shaft	Accessibility, Serviceability	5
Universal Joints	Accessibility, Serviceability	4
Rear Tire	Accessibility, Ease of Removal	4

MECHANICAL EVALUATION

2012 HARLEY-DAVIDSON ELECTRA GLIDE

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	5
Alternator	Accessibility, Amperage	5
Stator	Accessibility, Amperage	5
Starter	Accessibility, Power	5
Ignition	Accessibility	5
Spark Plugs	Accessibility	6
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	6
Fuse Box	Accessibility, Serviceability	5
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	4
Fuel Pump	Accessibility, Serviceability	4
Fuel Filter	Accessibility, Serviceability	4
Fuel Tank / Lines	Accessibility, Puncture Resistant	5
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	N/A
Water Pump	Accessibility, Belt Arrangement	N/A
Hoses	Accessibility	N/A
Coolant Recovery	Accessibility, Capacity	N/A
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	6
Drain Plug	Ease of Removal, Protection	10
Fluid Level Sight Glass	Accessibility, Night Usability	8
Clutch	Accessibility, Serviceability	7
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	9
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	5
Rear Wheel Brakes	Accessibility	4
ABS System	Accessibility, Serviceability, Reparability	4
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Muffler	Accessibility	8
Pipes	Accessibility, Support	6
Header Pipes	Accessibility, Protection	6

MECHANICAL EVALUATION **ELECTRA GLIDE - Continued**

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	7
Crash Bars	Accessibility, Ease of Removal	5
Patrol Equipment, Lights	Ease of Installation	6
Instrument Panels	Accessibility, Serviceability	8
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	5
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	5
Foot Controls	Accessibility, Serviceability, Protection	5
Saddlebags	Accessibility, Protection	5
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	5
Cylinder Head	Accessibility, Ease of Removal	5
Valve Covers	Accessibility, Valve Train Serviceability	5
Cylinder Removal	Accessibility, Serviceability,	5
Drain Plug	Ease of Removal, Durability	5
Fluid Level Sight Glass	Accessibility, Night Usability	5
Oil Filter	Accessibility, Capacity, Protection	9
Engine Mounts	Accessibility	6
Oil Coolers	Accessibility, Protection	4
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	7
Front Suspension	Accessibility, Serviceability	6
Rear Shock Absorbers	Accessibility, Serviceability	7
Rear Swing Arm	Accessibility, Serviceability	6
Front Tire	Accessibility, Ease of Removal	6
Axle Bearings & Seals	Accessibility, Serviceability	8
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	N/A
Drive Chain	Accessibility, Serviceability	2
Axle Bearings & Seals	Accessibility, Serviceability	4
Drive Shaft	Accessibility, Serviceability	N/A
Universal Joints	Accessibility, Serviceability	N/A
Rear Tire	Accessibility, Ease of Removal	3

MECHANICAL EVALUATION

2012 HARLEY-DAVIDSON ROAD KING

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	5
Alternator	Accessibility, Amperage	5
Stator	Accessibility, Amperage	5
Starter	Accessibility, Power	5
Ignition	Accessibility	5
Spark Plugs	Accessibility	8
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	6
Fuse Box	Accessibility, Serviceability	5
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	4
Fuel Pump	Accessibility, Serviceability	4
Fuel Filter	Accessibility, Serviceability	4
Fuel Tank / Lines	Accessibility, Puncture Resistant	5
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	N/A
Water Pump	Accessibility, Belt Arrangement	N/A
Hoses	Accessibility	N/A
Coolant Recovery	Accessibility, Capacity	N/A
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	3
Drain Plug	Ease of Removal, Protection	8
Fluid Level Sight Glass	Accessibility, Night Usability	9
Clutch	Accessibility, Serviceability	8
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	5
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	5
Rear Wheel Brakes	Accessibility	4
ABS System	Accessibility, Serviceability, Reparability	4
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Muffler	Accessibility	7
Pipes	Accessibility, Support	7
Header Pipes	Accessibility, Protection	6

MECHANICAL EVALUATION

ROAD KING - Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	7
Crash Bars	Accessibility, Ease of Removal	5
Patrol Equipment, Lights	Ease of Installation	6
Instrument Panels	Accessibility, Serviceability	5
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	6
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	5
Foot Controls	Accessibility, Serviceability, Protection	5
Saddlebags	Accessibility, Protection	5
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	5
Cylinder Head	Accessibility, Ease of Removal	6
Valve Covers	Accessibility, Valve Train Serviceability	6
Cylinder Removal	Accessibility, Serviceability,	5
Drain Plug	Ease of Removal, Durability	5
Fluid Level Sight Glass	Accessibility, Night Usability	5
Oil Filter	Accessibility, Capacity, Protection	4
Engine Mounts	Accessibility	3
Oil Coolers	Accessibility, Protection	4
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	4
Front Suspension	Accessibility, Serviceability	3
Rear Shock Absorbers	Accessibility, Serviceability	4
Rear Swing Arm	Accessibility, Serviceability	3
Front Tire	Accessibility, Ease of Removal	4
Axle Bearings & Seals	Accessibility, Serviceability	4
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	N/A
Drive Chain	Accessibility, Serviceability	2
Axle Bearings & Seals	Accessibility, Serviceability	4
Drive Shaft	Accessibility, Serviceability	N/A
Universal Joints	Accessibility, Serviceability	N/A
Rear Tire	Accessibility, Ease of Removal	3

MECHANICAL EVALUATION

2011 HONDA ST 1300-PA

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	5
Alternator	Accessibility, Amperage	3
Stator	Accessibility, Amperage	3
Starter	Accessibility, Power	5
Ignition	Accessibility	3
Spark Plugs	Accessibility	5
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	8
Fuse Box	Accessibility, Serviceability	5
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	5
Fuel Pump	Accessibility, Serviceability	4
Fuel Filter	Accessibility, Serviceability	4
Fuel Tank / Lines	Accessibility, Puncture Resistant	4
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	4
Water Pump	Accessibility, Belt Arrangement	4
Hoses	Accessibility	4
Coolant Recovery	Accessibility, Capacity	4
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	2
Drain Plug	Ease of Removal, Protection	10
Fluid Level Sight Glass	Accessibility, Night Usability	5
Clutch	Accessibility, Serviceability	6
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	5
Power Brake Assist	Accessibility	5
Front Wheel Brakes	Accessibility	6
Rear Wheel Brakes	Accessibility	6
ABS System	Accessibility, Serviceability, Reparability	5
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Catalytic Converter	Accessibility, Protection	7
Muffler	Accessibility	5
Pipes	Accessibility, Support	5
Header Pipes	Accessibility, Protection	5

MECHANICAL EVALUATION
HONDA ST1300- Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	9
Crash Bars	Accessibility, Ease of Removal	6
Patrol Equipment, Lights	Ease of Installation	6
Instrument Panels	Accessibility, Serviceability	5
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	4
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	8
Foot Controls	Accessibility, Serviceability, Protection	7
Saddlebags	Accessibility, Protection	8
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	4
Cylinder Head	Accessibility, Ease of Removal	4
Valve Covers	Accessibility, Valve Train Serviceability	4
Cylinder Removal	Accessibility, Serviceability,	3
Drain Plug	Ease of Removal, Durability	5
Fluid Level Sight Glass	Accessibility, Night Usability	5
Oil Filter	Accessibility, Capacity, Protection	8
Engine Mounts	Accessibility	6
Oil Coolers	Accessibility, Protection	4
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	7
Front Suspension	Accessibility, Serviceability	7
Rear Shock Absorbers	Accessibility, Serviceability	5
Rear Swing Arm	Accessibility, Serviceability	5
Front Tire	Accessibility, Ease of Removal	5
Axle Bearings & Seals	Accessibility, Serviceability	5
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	7
Drive Chain	Accessibility, Serviceability	N/A
Axle Bearings & Seals	Accessibility, Serviceability	7
Drive Shaft	Accessibility, Serviceability	7
Universal Joints	Accessibility, Serviceability	7
Rear Tire	Accessibility, Ease of Removal	6

MECHANICAL EVALUATION

2012 VICTORY VISION

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	4
Alternator	Accessibility, Amperage	5
Stator	Accessibility, Amperage	5
Starter	Accessibility, Power	4
Ignition	Accessibility	5
Spark Plugs	Accessibility	8
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	5
Fuse Box	Accessibility, Serviceability	5
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	5
Fuel Pump	Accessibility, Serviceability	5
Fuel Filter	Accessibility, Serviceability	5
Fuel Tank / Lines	Accessibility, Puncture Resistant	3
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	N/A
Water Pump	Accessibility, Belt Arrangement	N/A
Hoses	Accessibility	5
Coolant Recovery	Accessibility, Capacity	N/A
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	7
Drain Plug	Ease of Removal, Protection	5
Fluid Level Sight Glass	Accessibility, Night Usability	5
Clutch	Accessibility, Serviceability	5
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	5
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	4
Rear Wheel Brakes	Accessibility	5
ABS System	Accessibility, Serviceability, Reparability	5
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Catalytic Converter	Accessibility, Protection	7
Muffler	Accessibility	6
Pipes	Accessibility, Support	5
Header Pipes	Accessibility, Protection	5

MECHANICAL EVALUATION
VICTORY VISION- Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	6
Crash Bars	Accessibility, Ease of Removal	5
Patrol Equipment, Lights	Ease of Installation	5
Instrument Panels	Accessibility, Serviceability	4
Body Wiring	Accessibility, Serviceability, Protection	5
Seat	Ease of Removal	5
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	6
Foot Controls	Accessibility, Serviceability, Protection	5
Saddlebags	Accessibility, Protection	6
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	4
Cylinder Head	Accessibility, Ease of Removal	3
Valve Covers	Accessibility, Valve Train Serviceability	3
Cylinder Removal	Accessibility, Serviceability,	3
Drain Plug	Ease of Removal, Durability	8
Fluid Level Sight Glass	Accessibility, Night Usability	8
Oil Filter	Accessibility, Capacity, Protection	8
Engine Mounts	Accessibility	5
Oil Coolers	Accessibility, Protection	5
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	5
Front Suspension	Accessibility, Serviceability	5
Rear Shock Absorbers	Accessibility, Serviceability	4
Rear Swing Arm	Accessibility, Serviceability	4
Front Tire	Accessibility, Ease of Removal	5
Axle Bearings & Seals	Accessibility, Serviceability	5
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	N/A
Drive Chain	Accessibility, Serviceability	4
Axle Bearings & Seals	Accessibility, Serviceability	5
Drive Shaft	Accessibility, Serviceability	N/A
Universal Joints	Accessibility, Serviceability	N/A
Rear Tire	Accessibility, Ease of Removal	6

MECHANICAL EVALUATION

2012 VICTORY COMMANDER 1

ELECTRICAL SYSTEM	CONSIDERATIONS	RATING
Battery	Accessibility, Group, Size	4
Alternator	Accessibility, Amperage	5
Stator	Accessibility, Amperage	5
Starter	Accessibility, Power	4
Ignition	Accessibility	5
Spark Plugs	Accessibility	8
Lights	Accessibility of Headlight Adjustment, Ease of Replacement	4
Fuse Box	Accessibility, Serviceability	5
FUEL SYSTEM	CONSIDERATIONS	RATING
Fuel Injection	Accessibility, Serviceability	5
Fuel Pump	Accessibility, Serviceability	5
Fuel Filter	Accessibility, Serviceability	6
Fuel Tank / Lines	Accessibility, Puncture Resistant	6
COOLING SYSTEM	CONSIDERATIONS	RATING
Radiator	Accessibility, Protection, Adequate Size	N/A
Water Pump	Accessibility, Belt Arrangement	N/A
Hoses	Accessibility	5
Coolant Recovery	Accessibility, Capacity	N/A
TRANSMISSION	CONSIDERATIONS	RATING
Transmission / Gearbox	Ease of Removal, Serviceability	7
Drain Plug	Ease of Removal, Protection	5
Fluid Level Sight Glass	Accessibility, Night Usability	5
Clutch	Accessibility, Serviceability	5
Cooler	Accessibility, Protection	N/A
BRAKES	CONSIDERATIONS	RATING
Master Cylinder	Accessibility, Protection	5
Power Brake Assist	Accessibility	N/A
Front Wheel Brakes	Accessibility	4
Rear Wheel Brakes	Accessibility	5
ABS System	Accessibility, Serviceability, Reparability	5
EXHAUST SYSTEM	CONSIDERATIONS	RATING
Catalytic Converter	Accessibility, Protection	8
Muffler	Accessibility	6
Pipes	Accessibility, Support	5
Header Pipes	Accessibility, Protection	5

MECHANICAL EVALUATION
2012 VICTORY COMMANDER 1

Continued

BODY	CONSIDERATIONS	RATING
Windshield	Ease of Removal	9
Crash Bars	Accessibility, Ease of Removal	5
Patrol Equipment, Lights	Ease of Installation	5
Instrument Panels	Accessibility, Serviceability	5
Body Wiring	Accessibility, Serviceability, Protection	4
Seat	Ease of Removal	4
Body Panels	Ease of Removal	5
Handlebar Controls	Accessibility, Serviceability, Protection	6
Foot Controls	Accessibility, Serviceability, Protection	5
Saddlebags	Accessibility, Protection	5
ENGINE & ACCESSORIES	CONSIDERATIONS	RATING
Engine	Accessibility, Ease of Removal	4
Cylinder Head	Accessibility, Ease of Removal	3
Valve Covers	Accessibility, Valve Train Serviceability	3
Cylinder Removal	Accessibility, Serviceability,	3
Drain Plug	Ease of Removal, Durability	8
Fluid Level Sight Glass	Accessibility, Night Usability	8
Oil Filter	Accessibility, Capacity, Protection	8
Engine Mounts	Accessibility	5
Oil Coolers	Accessibility, Protection	4
STEERING & SUSPENSION	CONSIDERATIONS	RATING
Front Forks	Accessibility, Serviceability, Adjustability	5
Front Suspension	Accessibility, Serviceability	5
Rear Shock Absorbers	Accessibility, Serviceability	4
Rear Swing Arm	Accessibility, Serviceability	4
Front Tire	Accessibility, Ease of Removal	5
Axle Bearings & Seals	Accessibility, Serviceability	5
REAR AXLE DRIVE SHAFT	CONSIDERATIONS	RATING
Rear Gearbox	Accessibility, Serviceability	N/A
Drive Chain	Accessibility, Serviceability	4
Axle Bearings & Seals	Accessibility, Serviceability	5
Drive Shaft	Accessibility, Serviceability	N/A
Universal Joints	Accessibility, Serviceability	N/A
Rear Tire	Accessibility, Ease of Removal	4

COMMUNICATIONS EVALUATION RESULTS

The communications evaluation of each vehicle is conducted by technicians assigned to the Los Angeles County Sheriff's Department's Communications and Fleet Management Bureau. This evaluation concerns itself with the radio installation, the effect of radio operation on motorcycle performance and the effect of the motorcycle on radio performance.

The Electromagnetic Interference Susceptibility test is intended for use in the presence of electromagnetic fields resulting from use of public safety two-way radios.

Motorcycle performance must not be affected in any way by transmissions from a radio and antenna installed on the motorcycle and operating in any of the frequency ranges of 450 to 512 MHz, and having a radio frequency output no more than 50 watts. Motorcycle performance shall not be effected by the presence of another motorcycle equipped with the above described radio and operated next to the subject motorcycle.

Radiated and conducted electromagnetic interference motorcycle systems and accessories shall be designed to reduce interference with the use of public safety radio receivers or electronic sirens or sound amplifiers. The effective sensitivity of a receiver installed on the motorcycle shall not be reduced by more than the amount tabulated below for each frequency band:

FREQUENCY BAND	ALLOWABLE DEGRADATION
450 to 512 MHz	3 dB

Degradation is the difference in effective receiver sensitivity measured with the vehicle engine and accessories turned off as compared to that measured with the engine and accessories turned on.

Sensitivity is measured in terms of the 12 dB Sinad signal as defined in EIA Standard RS-204. To determine effective sensitivity, the receiver is connected to the antenna through an isolating tee connector which allows introduction of the signal generator through the isolated port. Comparative signal strength readings are then taken with and without the interference present.

COMMUNICATION NOISE EVALUATION

2010 BMW R 1200 RT-P

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-88dB	-90dB	0dB
Engine Idle (No Acc)	-88dB	-90dB	0dB
Engine High RPM (No Acc)	-88dB	-90dB	0dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-88dB	-90dB	0dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-88dB	-90dB	0dB
Engine High RPM W/All Acc	-88dB	-90dB	0dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	10
Microphones	4
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	6
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2012 HARLEY- DAVIDSON ROAD KING

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-81dB	-93dB	1dB
Engine Idle (No Acc)	-81dB	-93dB	1dB
Engine High RPM (No Acc)	-88dB	-93dB	1dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-81dB	-93dB	1dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-89dB	-93dB	1dB
Engine High RPM W/All Acc	-88dB	-93dB	2dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2012 HARLEY- DAVIDSON ELECTRA GLIDE

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-89dB	-92dB	1dB
Engine Idle (No Acc)	-89dB	-92dB	1dB
Engine High RPM (No Acc)	-88dB	-92dB	1dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-89dB	-92dB	1dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-89dB	-92dB	1dB
Engine High RPM W/All Acc	-88dB	-92dB	1dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2010 KAWASAKI CONCOURS 14 ABS

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-87dB	-90dB	0dB
Engine Idle (No Acc)	-87dB	-90dB	0dB
Engine High RPM (No Acc)	-87dB	-90dB	0dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-87dB	-90dB	2dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-87dB	-90dB	2dB
Engine High RPM W/All Acc	-86dB	-90dB	2dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2009 HONDA ST 1300-PA9

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-88dB	-92dB	2dB
Engine Idle (No Acc)	-88dB	-92dB	2dB
Engine High RPM (No Acc)	-88dB	-92dB	2dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-88dB	-92dB	2dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-88dB	-92dB	2dB
Engine High RPM W/All Acc	-88dB	-92dB	2dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2012 VICTORY VISION

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-89dB	-93dB	1dB
Engine Idle (No Acc)	-89dB	-93dB	1dB
Engine High RPM (No Acc)	-89dB	-93dB	1dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-89dB	-93dB	1dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-89dB	-93dB	1dB
Engine High RPM W/All Acc	-89dB	-93dB	1dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding

COMMUNICATION NOISE EVALUATION

2012 VICTORY COMMANDER

RADIO MAKE	MODEL NO.	ANTENNA TYPE	LOCATION
Motorola XTL-5000	M20SSS9PW1AN	5dB Gain Whip	Rear

FREQUENCY: 483.0875 MHz

WITH ANTENNA	12 dB SINAD	20 dB QUIETING	DESENS dB
Engine Off	-89dB	-92dB	1dB
Engine Idle (No Acc)	-89dB	-92dB	1dB
Engine High RPM (No Acc)	-89dB	-92dB	1dB
Engine Idle W/Air	N/A	N/A	N/A
Engine Idle W/ Lights	-89dB	-92dB	1dB
Engine Idle W/Heater	N/A	N/A	N/A
Engine Idle W/All Acc	-80dB	-72dB	10dB
Engine High RPM W/All Acc	-80dB	-77dB	10dB

Also Tested: Monitored approx. 200 frequencies between. No spurious signal detected. Radios used XTS-5000 portable.

Glove Compartment Accessibility – (Undercover Use)	Rating **
Radio Control Head	5
Speakers	5
Microphones	5
One Radio Installation	5
Antenna Installation	5
Battery Terminal Connection	5
Accommodation for Cables	5
Hidden Siren Installation	N/A
Clip – on Connections for Accessories	5

** 1 – Poor 5 – Average 10 – Outstanding